Sensorsoft®

Sensorsoft® Thermometer User Manual

Models ST6105J, ST6105C and ST6154J

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Table of Contents

Overview 4
About this Manual 4
Installing the Sensorsoft Thermometer 5
  Choosing an Installation Location 5
  Connecting the Sensorsoft Thermometer to a serial port 5
ST6105C Sensorsoft Thermometer Specifications 7
ST6105J Sensorsoft Thermometer Specifications 8
ST6154J Sensorsoft Thermometer Specifications 9
Resolution, Accuracy and Calibration 10
  Avoid making invalid judgements or comparisons 10
  Use the proper instrument and method to make comparisons 10
  What to do, if you believe the Sensorsoft device is reading incorrectly 11
Making extension cables for C-Suffix Sensorsoft Devices 12
Making communication cables for J-Suffix Sensorsoft Devices 13
Writing programs for the Sensorsoft Thermometer 16
  Sending commands to the Sensorsoft Thermometer 16
  Receiving responses from the Sensorsoft Thermometer 18
  Converting DATA-byte(s) to temperature readings 19
  Reading the Sensorsoft ID Record 21
Getting Help 23
  Limited Warranty 23
  Technical Support 23
  30 Day Money Back Guarantee 23
  Returns 23
FCC Compliance and Advisory Statement 24

Overview

The ST6105C, ST6105J and ST6154J Soft Thermometers are RS232 compatible serial devices based on the Sensorsoft Device Protocol. The ST6105C and ST6105J have a built-in temperature sensor and are intended for applications where the customer needs to monitor or measure temperature in rooms or warehouses. The ST6154J has an external probe and is intended for applications where the temperature probe can be located outdoors, immersed in a liquid or slipped into hard to reach places.

Sensorsoft devices offer the following benefits over other RS232 serial devices:

- Powered from the serial port (no external power or battery required)
- CRC error detection (detects transmission errors and improves reliability)
- Virtually unlimited cable lengths (1000 ft)
- Plug and go operation (little or no user configuration required)

About this Manual

The Sensorsoft Thermometer may also be referred to as a Soft Thermometer, Sensorsoft device or SSD (Sensorsoft Soft Device) throughout this manual.

Installing the Sensorsoft Thermometer

Installation of the Sensorsoft Thermometer is composed of the following steps:

- Choosing an Installation Location
- Connecting the Sensorsoft Thermometer to a serial port
- Starting the Sensorsoft software. Please refer to the specific software manual that applies to your installation.

Choosing an Installation Location

Model ST6105C and ST6105J

Locate these Sensorsoft Thermometer close to the equipment or airflow you are monitoring. Since the ST6105C/J Sensorsoft Thermometer is not waterproof or weatherproof, keep the following rules in mind:

- Keep the Sensorsoft Thermometer housing out of contact with direct sunlight, UV exposure and dripping water.
- Protect the Sensorsoft Thermometer from high traffic areas that could wear/damage the housing or cable.
- Never allow the plastic housing of the Sensorsoft Thermometer to come into contact with harsh chemicals or cleaning agents. If it needs to be cleaned, do so with a damp cloth or vacuum cleaner.

Use a Velcro fastener (P/N F1000 or F1001) to affix the Sensorsoft Thermometer to a stable surface.

Model ST6154J

Since this Sensorsoft Thermometer has an external stainless steel probe, you may expose the probe portion to liquids or outdoor environments. However the same restrictions apply to main plastic housing as does with the ST6105C/J above.

Connecting the Sensorsoft Thermometer to a serial port

If you have a ST6105C (C-Suffix) Sensorsoft Thermometer, plug its molded DB-9F connector into an available RS232 serial port connector (DB-9M) on your computer or device server.

If you have an ST6105J or ST6154J (J-Suffix) Sensorsoft Thermometer, use the appropriate C200X cable to connect this device to your computer or device server. Please refer to the Sensorsoft price list for available types.

If you intend to make your own custom cable for a J-Suffix Sensorsoft device, please refer to *Making communication cables for J-Suffix Sensorsoft Devices.*

If you are connecting a Sensorsoft Thermometer to a device server please be sure to configure the port as follows:

- 1200 bps, 8 bits, no parity, 1 stop bit
- Turn off autobaud
- Flow control set to none
- Non-telnet binary (raw) transfer mode
- Assert RTS and DTR always

Refer to your device server's documentation for more details on the above.

Note the physical or COM port number where you plugged the cable into your computer or device server. If the Sensorsoft Thermometer is being plugged into a Windows based computer that has only one COM port, the port number is usually COM1.

ST6105C Sensorsoft Thermometer Specifications

Measurement Range: -40 º C to +60 º C (-40 º F to +140 º F)
Resolution or precision: 0.1 º C (0.18 º F) and 0.5 º C (0.9 º F)
Accuracy: +/- 0.5 º C (+/- 0.9 º F) over 0 º C to +60 º C (32 º to 140 º F) and +/- 1 º C (1.8 º F) over remainder of temperature range
Calibration: Calibrated at the factory. Re-calibration in the field is not possible, but sensor can be replaced. See Sensor type below for replacement part number.
Maximum measurement rate: one reading every second
Housing Dimensions: 8 cm (3.1") x 4 cm (1.6") x 2 cm (0.8")
Housing Material: injection molded ABS thermoplastic
Housing Color: light gray
Sensor type: semiconductor, internal (Dallas Semiconductor DS18S20)
Communications cable: integrated 6 m (20 ft.) cable with DB-9F (female) mini D-SUB connector
Power source: Port-powered (RTS and DTR, both asserted).
Power supply current drain: < 10 mA
Communications Interface: RS232C using TX,RX,RTS,DTR and GND. One device per serial port.
Maximum extension cable length: 305 m (1000 ft.) using recommended cable type. Low capacitance shielded cable or UTP is recommended.
Communications Protocol: Sensorsoft Device Protocol, Version 2.0
Error control: 16 bit CRC (cyclic redundancy checking) for detection of communication errors between the device and host computer.

ST6105J Sensorsoft Thermometer Specifications

Measurement Range: -40 º C to +60 º C (-40 º F to +140 º F)
Resolution or precision: 0.1 º C (0.18 º F) and 0.5 º C (0.9 º F)
Accuracy: +/- 0.5 º C (+/- 0.9 º F) over 0 º C to +60 º C (32 º to 140 º F) and
+/- 1 º C (1.8 º F) over remainder of temperature range
Calibration: Calibrated at the factory. Re-calibration in the field is not possible, but sensor can be replaced. See Sensor type below for replacement part number.
Maximum measurement rate: one reading every second
Housing Dimensions: 8 cm (3.1") x 4 cm (1.6") x 2 cm (0.8")
Housing Material: injection molded ABS thermoplastic
Housing Colour: light gray
Sensor type: semiconductor, internal (Dallas Semiconductor DS18S20)
Communications connector: 8 position modular jack, (accepts 8 position plug RJ45)
Power source: Port-powered (RTS and DTR, both asserted) or via External DC power connector
Power supply current drain: < 10 mA
External DC power connector: 2.1 mm power jack, automatic polarity correction and over-voltage protection.
External power supply voltage: 6.0 - 12.0 VDC
Communications Interface: RS232C using TX,RX,RTS,DTR and GND. One device per serial port.
Maximum communications cable length: 305 m (1000 ft.) using recommended cable type. Low capacitance shielded cable or UTP is recommended.
Communications Protocol: Sensorsoft Device Protocol, Version 2.0
Error control: 16 bit CRC (cyclic redundancy checking) for detection of communication errors between the device and host computer.

ST6154J Sensorsoft Thermometer Specifications

Probe measurement range: -55 º C to +125 º C (-67 º F to +257 º F)
Resolution or precision: 0.1 º C (0.18 º F) and 0.5 º C (0.9 º F)
Accuracy: +/- 0.5 º C (+/- 0.9 º F) over 0 º C to +70 º C (32 º to 158 º F) and
+/- 1 º C (1.8 º F) over remainder of temperature range
Calibration: Calibrated at the factory. Re-calibration in the field is not possible. Sensor probe can be replaced if returned to the factory.
Maximum measurement rate: one reading every second
Probe dimensions: 20.3 cm (8") long, 6 mm (1/4") diameter, stainless steel probe with 1.2 m (4 ft.) long, high-temp silicone rubber cable.
Sensor type: semiconductor (Dallas Semiconductor DS18S20)
Housing Dimensions: 8 cm (3.1") x 4 cm (1.6") x 2 cm (0.8")
Housing Material: injection molded ABS thermoplastic
Housing Color: light gray
Housing operating temperature: -40 º C to +60 º C (-40 º F to +140 º F)
Communications connector: 8 position modular jack, (accepts 8 position plug RJ45)
Power source: Port-powered (RTS and DTR, both asserted) or via External DC power connector
Power supply current drain: < 10 mA
External DC power connector: 2.1 mm power jack, automatic polarity correction and over-voltage protection.
External power supply voltage: 6.0 - 12.0 VDC
Communications Interface: RS232C using TX,RX,RTS,DTR and GND. One device per serial port.
Maximum communications cable length: 305 m (1000 ft.) using recommended cable type. Low capacitance shielded cable or UTP is recommended.
Communications Protocol: Sensorsoft Device Protocol, Version 2.0
Error control: 16 bit CRC (cyclic redundancy checking) for detection of communication errors between the device and host computer.

Resolution, Accuracy and Calibration

The terms resolution, accuracy and calibration frequently cause misunderstanding for many individuals who have not been trained in metrology. We endeavor here to explain these terms and how they might affect your application of Sensorsoft devices.

Resolution or precision is the fineness of the measurement. It is usually specified in terms of the smallest unit that can be resolved.

Accuracy is the trueness of the measurement or how close it can be to the true value (National Standard). Accuracy is often specified as a percentage (i.e. +/- 3 % of reading), or a fixed value (i.e. +/- 0.5) that the reading can vary from the true value.

Calibration is a process where accuracy is verified (and often corrected) with respect to a standard. Calibrations are routinely carried out to certify that a device has not lost its accuracy, linearity and stability. Calibrations can be carried out at a time interval that is required by your industry. In many cases this is done at least once every year. When a calibration or verification takes place, it must always be done with equipment that has significantly better accuracy and resolution then the device under test. When a calibration is performed on a unit under test with an instrument that is proven as traceable to the National Standards Laboratory, the unit under test is also considered to be traceable.

Avoid making invalid judgements or comparisons

Using any of the following measurement devices or situations is **unacceptable** for comparing to, or judging the accuracy of a Sensorsoft device:

- Measurement device purchased from a hardware or drug store
- Digital display on HVAC or cooling/heating equipment
- Location of the active sensing element is unknown
- Measurement device has its active sensing element more than one inch (2.5 cm) away from the Sensorsoft device/probe
- Measurement device has similar specifications to the Sensorsoft device
- Measurement device has unknown specifications
- Measurement device has not been calibrated within one year, has no calibration certificate or is not traceable to a standard

Use the proper instrument and method to make comparisons

We recommend one of the following instruments (or equivalent) that have a recently dated traceable calibration certificate, for judging the accuracy or stability of your Sensorsoft device:

- Vaisala HM34 Humidity & Temperature Meter (Hand held, approx. price $500 USD)
- Vaisala HMP233 Humidity & Temperature Transmitter and external probe (Wall mount, RS232 interface, order with 115/230 VAC power supply, approx. price $1800 USD)
- Vaisala HMI38/HMP35E Humidity & Temperature Data Processor and external probe (Desk top unit, RS232 interface, approx. price $2580 USD)

More details about the above instruments are available on Vaisala's web site:

http://www.vaisala.com

Keep the following points in mind when assessing the accuracy or stability of your Sensorsoft device:

- Use one of the above recommended instruments (or equivalent)
- Recommended instrument has had a traceable calibration within one year of current date
- Sensorsoft device and the traceable instrument's probe must be exactly side by side (within one inch of each other)
- Allow sufficient time (10-20 minutes) for the Sensorsoft device and the traceable instrument to stabilize

What to do, if you believe the Sensorsoft device is reading incorrectly

If after following the above procedure you find that the Sensorsoft device is not reading within its stated specifications, you have two options:

a) Return the Sensorsoft device to our factory for repair or calibration. See Returns at the end of this guide. Charges may apply if the unit is out-of-warranty or if we find no evidence that the device is out-of-calibration.

b) If you have access to a local calibration lab you may send it there for verification or calibration along with the Remote Watchman software. Refer to the specifications of your Sensorsoft device to determine whether its sensor can be re-calibrated or replaced.

Making extension cables for C-Suffix Sensorsoft Devices

In some applications it is not possible to use pre-assembled cables. When installing the Sensorsoft device at a remote location it may be necessary to run cables through walls, ceiling or conduits where connectors would get jammed. In this situation it makes sense to run the cables and then terminate them, on-site, using hand tools. Further, if your host serial port is of the DCE type (some multi-port serial cards) it will be necessary to make your own cables. The following details will assist you in doing that.

A properly made cable will allow your Sensorsoft device to operate reliably over long distances.

PIN-OUT OF THE DB-9F CONNECTOR ON A C-SUFFIX SENSORSOFT DEVICE
Note: Only positions used in Sensorsoft device application are shown

Position	Function
2	TX (data to computer)
3	RX (data from computer)
4	POWER (connects to DTR on computer)
5	Ground
7	POWER (connects to RTS on computer)

The following are suggested specialized tools and parts needed to make good quality extension cables:

Hand Tools:
AMP Crimping Tool P/N 90312-1 or 90302-1, for subminiature D pin or socket contacts
AMP PROCRIMPER P/N 58448-2, for subminiature D pin or socket contacts
AMP Insertion/Extraction Tool P/N 91285-1, for subminiature D connector contacts

Materials:
Berk-Tek UTP (Unshielded Twisted Pair) round stranded cable, P/N 540036--TP
(4 pair, 8-#24 AWG wires, category 4 or better, 75 C)
AMP DB-9 receptacle subminiature D connector (crimp-snap-in), P/N 205203-1 or -3
AMP DB-25 receptacle subminiature D connector (crimp-snap-in), P/N 205207-1 or 207463-1
AMP socket crimp contact for subminiature D connectors, P/N 1-66504-0
AMP pin crimp contact for subminiature D connectors, P/N 1-66506-0

Making communication cables for J-Suffix Sensorsoft Devices

In some applications it is not possible to use pre-assembled cables. When installing the Sensorsoft device at a remote location it may be necessary to run cables through walls, ceiling or conduits where connectors would get jammed. In this situation it makes sense to run the cables and then terminate them, on-site, using hand tools. Further, if your host serial port is of the DCE type (some multi-port serial cards) it will be necessary to make your own cables. The following details will assist you in doing that.

A properly made cable will allow your Sensorsoft device to operate reliably over long cable lengths up to 305 m (1000 ft) long. You may connect the Sensorsoft device to the port with as little as three wires (RX,TX and GND) using inexpensive unshielded telephone wire. However the host may need to set the number of retries high in order to overcome the effect of occasional noise/interference and would also require the use of an external power supply at the Sensorsoft Thermometer.

The Sensorsoft device modular jack connector uses the same UTP wire map as 10-BASE-T and ISDN. It is therefore possible to use this type of cabling system for Sensorsoft devices.

PIN-OUT OF THE MODULAR 8 POSITION JACK/PLUG ON A SENSORSOFT DEVICE
Note: Terminal No. 1 is the terminal to the extreme left as you face the cable opening, latch tab down.

Terminal	Function	UTP wire color (solid-tracer)
1	ST Receive Data	white-green
2	Ground	green
3	ST Transmit Data	white-orange
4	Power +V	blue
5	Ground	white-blue
6	Ground	orange
7	Power +V	white-brown
8	Ground	brown

The following are suggested specialized tools and parts needed to make good quality cables:

Hand Tools:
AMP Crimping Tool P/N 1-231652-0 or 2-231652-1, for modular plugs
AMP 8 position modular die set P/N 853400-1
AMP Crimping Tool P/N 90312-1 or 90302-1, for subminiature D pin or socket contacts
AMP PROCRIMPER P/N 58448-2, for subminiature D pin or socket contacts
AMP Insertion/Extraction Tool P/N 91285-1, for subminiature D connector contacts
Materials:
Berk-Tek UTP (Unshielded Twisted Pair) round stranded cable, P/N 540036--TP
(4 pair, 8-#24 AWG wires, category 4 or better, 75 C)
AMP 8 position modular plug for round stranded wire cables, P/N 5-554169-3 (CAT4)
AMP 8 position modular plug for round stranded wire cables, P/N 5-557961-3 (CAT5)
AMP DB-9 receptacle subminiature D connector (crimp-snap-in), P/N 205203-1 or -3
AMP DB-25 receptacle subminiature D connector (crimp-snap-in), P/N 205207-1 or 207463-1
AMP socket crimp contact for subminiature D connectors, P/N 1-66504-0
AMP pin crimp contact for subminiature D connectors, P/N 1-66506-0

Cable P/N C2000
9 pin Serial Port to Sensorsoft Device
DB-9F to RJ45 modular plug

9 pin Port			Sensorsoft Device	
3	TX	white-green	RX	1
2	RX	white-orange	TX	3
4	DTR	white-brown	POWER +V	7
7	RTS	blue	POWER +V	4
5	SIGNAL GND	green	GND	2

P/N C2000 is for use with PC's and most other devices which have a 9 position serial port. F indicates female/socket type connector.

Cable P/N C2001 and C2002
DTE Serial Port to Sensorsoft Device
DB-25 to RJ45 modular plug

DTE Port			Sensorsoft Device	
2	TX	white-green	RX	1
3	RX	white-orange	TX	3
20	DTR	white-brown	POWER +V	7
4	RTS	blue	POWER +V	4
7	SIGNAL GND	green	GND	2

P/N C2002 is for use with Sun SPARCstation or SPARCserver serial ports A or B. The DTE end of this cable uses a DB-25M connector. P/N C2001 is for use with PC's which have a DB-25 connector. The DTE end of this cable uses a DB-25F connector. M indicates male/pin type connector. F indicates female/socket type connector.

Cable P/N C2012
DCE Serial Port to Sensorsoft Device
DB-25M to RJ45 modular plug

DCE Port			Sensorsoft Device	
3	TX	white-green	RX	1
2	RX	white-orange	TX	3
6	DSR	white-brown	POWER +V	7
5	CTS	blue	POWER +V	4
7	SIGNAL GND	green	GND	2

P/N C2012 is for use with some multiport cards and terminal servers which have a DCE pin-out. M indicates male/pin type connector.

Writing programs for the Sensorsoft Thermometer

The following describes how to write your own programs for the Sensorsoft Thermometer. This Sensorsoft device uses a binary, packet-formatted, master-slave protocol. All data is represented in the **little endian format** - least significant byte is first and the most significant byte is last. Your host computer (master) must send commands to and receive responses back from the Sensorsoft device (slave).

Use the following parameters when programming the serial port where the Sensorsoft device is connected:

Bit rate: 1200 bps
Bits: 8
Parity: none
Stop bits: 1
Flow control: none
Null discard: do not strip NULL bytes

In order to make use of the port powered feature of the Sensorsoft device you must enable serial port lines DTR and RTS when the port is opened. A delay of 1-2 seconds is required after opening the serial port before any commands are sent to the Sensorsoft device. This delay allows the Sensorsoft device to power-up correctly before it receives any commands and prevents incorrect readings.

You should also be aware that the Sensorsoft device has an inter-packet retry time-out delay. This delay is one (1) second and is encoded into the Sensorsoft device's firmware. If your program sends a command to the Sensorsoft device and it receives no response, your program must wait at least one (1) second before re-sending that command. Possible reasons that a Sensorsoft device may ignore your commands can be due to data transmission (CRC) errors or improper power-up delay during hot plugging.

Sending commands to the Sensorsoft Thermometer

Each command packet your host sends to the Sensorsoft Thermometer must be in the following format:

<CMD-byte> <PACKETlength-bytes> <ADDRESS-bytes> <ARGUMENT-byte> <CRC-bytes>

CMD-byte
A single byte command indicating the desired action the Sensorsoft Thermometer device should carry out.

PACKETlength-bytes
Two bytes indicating the total length of the packet from start to finish (includes CRC bytes).

ADDRESS-bytes
The six-byte (48-bit) address of the device you are sending the command to. For RS232 Sensorsoft devices this is always decimal 1.

ARGUMENT-byte
The number of the Sensorsoft Thermometer's internal register you want to read or write. This byte is required for the temperature command. This byte is not required for the status command.

CRC-bytes
A two byte (16 bit) Cyclic Redundancy Check that is calculated on the entire packet from the CMD byte to the last ARGUMENT byte or ADDRESS byte. In the examples below, the last two bytes in each command string are CRC bytes that were pre-calculated.

Send the following bytes to request a status reading:
<C1h><0Bh><00h><01h><00h><00h><00h><00h><00h><47h><98h>

Send the following bytes to request a temperature reading in Celsius (0.5 C resolution):
<C5h><0Ch><00h><01h><00h><00h><00h><00h><00h><**01h**><0Eh><49h>

Send the following bytes to request a temperature reading in Celsius (0.1 C resolution):
<C5h><0Ch><00h><01h><00h><00h><00h><00h><00h><**02h**><6Dh><79h>

Receiving responses from the Sensorsoft Thermometer

Each response packet the Sensorsoft Thermometer returns is in the following format:

<RESPONSE-byte> <PACKETlength-bytes> <DATA-byte(s)> <CRC-bytes>

RESPONSE-byte
A single byte response code indicating the type of response. Valid codes are 90 hex or 94 hex.

PACKETlength-bytes
Two bytes indicating the total length of the packet from start to finish (includes CRC bytes).

DATA-byte(s)
Most responses return additional data in the form of byte(s). In response to a temperature command, two bytes are returned for DATA-byte(s). In response to a status command, one byte is returned for DATA-byte(s). See *SENSORSOFT DEVICE STATUS BYTE FORMAT* chart.

CRC-bytes
A two byte (16 bit) Cyclic Redundancy Check. This placeholder is filled with CRC bytes calculated by the Sensorsoft device on the entire packet from the RESPONSE byte to the last DATA-byte. These bytes allow the host to verify the integrity of the response packet. You may choose to use or ignore these bytes depending on your programming skill or application.

The Sensorsoft device returns a normal RESPONSE-byte **(90 hex)** in acknowledgement that the previous host command was received and executed without errors. The Sensorsoft device only acknowledges correctly received commands that have no CRC errors. If the Sensorsoft device detects a CRC error in a received command packet, it does not respond to the command. It is considered the job of the host to time-out and re-transmit that command packet.

When an internal problem occurs inside the Sensorsoft device it sends out an abnormal response byte **(94 hex)** in response to any command from the host. If the host receives this response byte, it must immediately read and interpret the Sensorsoft device's status to determine the problem. See *SENSORSOFT DEVICE STATUS BYTE FORMAT* chart.

The generator polynomial used for the CRC is hexadecimal 1021. The following references provide information for readers who wish to use the CRC capability;

- Calculating CRC's by Bits and Bytes, Greg Morse, Byte Magazine, September 1986, Pg. 115-124
- Implementing CRC's, Jack Crenshaw, Embedded Systems Programming Magazine, January 1992, Pg. 18-45
- Technical Aspects of Data Communication, John McNamara, Digital Equipment Press 1982, Pg. 110-122
- Data and Computer Communications, 2nd edition, William Stallings, Macmillan Publishing, Pg. 107-112
- The modem reference: the complete guide to selection, installation, and applications, 2nd edition, Michael A Banks, Brady Publishing 1991, Pg. 27-42

SENSORSOFT DEVICE STATUS BYTE FORMAT

BIT	NAME	DESCRIPTION
0	Low power supply	Voltage is unacceptable for reliable operation
1	IRQ enable	N/A
2	IRQ pending	N/A
3	Power-up	Sensorsoft device just powered-up
4	Tamper	Sensor element is disconnected or broken
5	NV option	N/A
6	EEPROM fail	N/A
7	Future use	N/A

A logic one condition on any of these bits indicates the condition is set or active. Otherwise they are reset to logic zero. It is a good practice for the host to check the status of the Sensorsoft device on a regular basis in case a bit changes state.

If bit 0 is set, this indicates that the Sensorsoft device power supply voltage is too low.

When bit 3 is set, this indicates that the Sensorsoft device has just powered-up. This bit gets reset after the status is read.

When bit 4 is set, this indicates that the sensor element has become damaged, disconnected or is being subjected to a high level of RFI (radio frequency interference) or EMI (electro magnetic interference).

Bits 1,2,5,6 and 7 can be ignored, they are not used.

Converting DATA-byte(s) to temperature readings

In response to a temperature command the Sensorsoft Thermometer returns two bytes in the DATA-byte(s) placeholder, as described below.

It is the job of the host software to convert the DATA-byte(s) to a floating-point number. It is then possible to display readings in Celsius or Fahrenheit scale. The following procedure explains the steps required:

1. Check the value of the most significant DATA-byte. If it is FFh the number is negative and requires processing by steps 2,3,4 and 5. If it is 00h the number is positive and requires processing by steps 3 and 5.

2. Invert the bits of the least significant DATA-byte, then add 1 to it.

3. Convert the least significant DATA-byte to a floating-point number.

4. Multiply the previous by -1 to get the negative result.

5. To obtain a temperature in Celsius, divide the previous result by 2. For Fahrenheit, multiply the Celsius value by 9, divide by 5 and add 32.

SENSORSOFT THERMOMETER TEMPERATURE DATA-byte(s) FORMAT

Temperature	Binary MSB LSB	Hex
+ 125 °C	00000000 11111010	00FAh
+ 85 °C	00000000 10101010	00AAh
+ 70 °C	00000000 10001100	008Ch
+ 25 °C	00000000 00110010	0032h
+ 0.5 °C	00000000 00000001	0001h
0 °C	00000000 00000000	0000h
– 0.5 °C	11111111 11111111	FFFFh
– 25 °C	11111111 11001110	FFCEh
– 40 °C	11111111 10110000	FFB0h
– 55 °C	11111111 10010010	FF92h

Please note that the least significant temperature DATA-byte is in terms of a 0.5 ° C. The sign bit is duplicated into all of the bits of the most significant DATA-byte.

The second format provided by this device for temperature is in IEEE Floating-Point Standard (single precision) and has a useable resolution of 0.1 degree Celsius. Commands that query register 2 in the Sensorsoft Thermometer will receive a four byte response in the DATA-byte(s) placeholder. Decoding these IEEE Floating-Point bytes is beyond the scope of this document.

Reading the Sensorsoft ID Record

Every Sensorsoft device (SSD) accepts an identification (ID) command, whose response can be used to uniquely identify the type of SSD currently connected. Specifically, the model number and description can be extracted from the SSD's ID response, allowing application software to determine the specific model of the SSD connected and to configure itself appropriately.

The format of the ID command is identical to the format of all other commands, described earlier.

Send the following bytes to the SSD to request the ID:

<C3h><0Bh><00h><01h><00h><00h><00h><00h><00h><20h><5Eh>

The ID response contains four variable-length, null-terminated strings. The sequence of four strings begins at the 10th byte in the response packet.

To read the SSD's description, count to the 10th byte in the ID response and extract the following ASCII null-terminated string.

Following this is the manufacturer's name; also a null-terminated string.

The third null-terminated string is the SSD's model number. The model number can be used to uniquely identify the type of SSD, so that your software can configure itself appropriately for different models of SSDs.

The fourth and final null-terminated string is the SSD's firmware version.

Structure of the ID response packet

Byte	Description of field
1	Response byte
2-3	Packet length
4-9	Not used
10	Device name or description (null-terminated)
~	Manufacturer (null-terminated)
~	Model Number (null-terminated)
~	Firmware Version (null-terminated)
~	Record Terminator (FFh)
~	CRC bytes (2)

Sample ID response packet from a ST6105 Sensorsoft Thermometer

Byte	Contents
1	<90h>
2	<4Fh>
3	<00h>
4-9	<01h> <00h> <00h> <03h> <03h> <07h>
10	Sensorsoft (R) Thermometer<00h>
~	Sensorsoft Corp.<00h>
~	ST6105J<00h>
~	4.00<00h>
~	<FFh>
~	<CEh> <CBh>

Getting Help

Limited Warranty

Sensorsoft Corporation warranties Sensorsoft products to be free from manufacturing defects for a period of two years. This includes parts and labor. All shipping and brokerage fees are your responsibility when returning a Sensorsoft product for warranty claims. The following will void the warranty and 30 day money back guarantee:

- signs of water or chemical damage
- cracks to the housing
- signs of tampering or reverse engineering

Technical Support

If in the unlikely event you should have problems installing or using your Sensorsoft product and the previous sections of this manual have failed to provide a solution, we offer technical support to help you overcome your difficulties (see web site address below). No-charge installation and configuration support is provided for 90 days, after that there is a per-incident fee. Sensorsoft Corporation **does not** provide free support to those wishing to write their own software; this is available on a charge-per-incident basis only. Please contact support for current rates.

World Wide Web: http://www.sensorsoft.com
E-mail: support@sensorsoft.com

30 Day Money Back Guarantee

If for any reason you want to return a Sensorsoft product for a refund, you can do so within 30 days (calendar days) of your purchase. The refund does not include shipping or brokerage fees you may have incurred or paid.

Returns

If returning a product or item, please keep in mind the follow guidelines:

- Contact Sensorsoft for an RMA number (Return Material Authorization).
- Provide a detailed explanation or reason for returning the product.
- Return shipments that bear no RMA number (on the outside of the package) or are not prepaid for shipping/clearing charges, will be refused.

FCC Compliance and Advisory Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against such interference when operating in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with this guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his or her own expense, will be required to take whatever measures may be required to correct the interference.

Warning: Changes or modifications to this device not explicitly approved by Sensorsoft Corporation will void the user's authority to operate this device.